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The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JANIS VIRBULIS,
WILFRIED VON AMMON,
ERICH TOMZIG,
YURI GELFGAT, and
LEONID GORBUNOV

Appeal 2008-001437
Application 10/053,446
Technology Center 1700

Decided: October 28, 2009

Before BEVERLY A. FRANKLIN, LINDA M. GAUDETTE, and MICHAEL P. COLAIANNI, *Administrative Patent Judges.*

COLAIANNI, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants seek review under 35 U.S.C. § 134 from the Examiner's rejections of claims 1, 2, and 14 in the Final Office Action.[1] This Board has jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

Appellants' invention is a process of producing a silicon single crystal by pulling the silicon single crystal from a melt that is exposed to a traveling magnetic field (Spec. 1).

Claim 1 is illustrative:

1. A process far [sic, for] producing a silicon crystal comprising

pulling a silicon single crystal from a silicon melt which is contained in a crucible having a crucible wall and having a crucible diameter of at least 450 mm,

placing a heat shield above said crucible; and said silicon single crystal being pulled with a diameter of at least 200 mm; and

exposing the silicon melt to a magnetic field consisting of a traveling magnetic field which exerts a substantially vertically downward oriented force on the melt in a region of the crucible wall [;] and

applying the magnetic field with an intensity which is sufficient to attenuate low-frequency temperature fluctuations in the melt and to establish a convection which is initially directed to a bottom of the crucible.

The Examiner cites and relies upon the following prior art as evidence of unpatentability[2]:

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[1] The rejection of claim 17 was withdrawn by the Examiner (Ans. 2-3). The Examiner allowed the subject matter of claim 17 (Ans. 3). Accordingly, claim 17 is no longer on appeal.

[2] The Examiner cites to Wilson, U.S. Patent 6,284,384 B1 issued September 4, 2001, further explaining the correlation between parts per million and atomic density (Ans. 5). However, Wilson was not included in the statement

Lari	US 4,905,756	Mar. 6, 1990
Iida	US 6,077,343	Jun. 20, 2000
Morishita (as translated)	JP 61-029128	Feb. 10, 1986
Haida (as translated)	DE 3701811 A1	Aug. 4, 1988

The Examiner maintains the following rejections of the pending claims:

1. Claims 1 and 2 are rejected under 35 U.S.C. § 103(a) over Iida in view of Haida.
2. Claim 14 is rejected under 35 U.S.C. § 103(a) over Iida in view of Haida, and Lari or Morishita.

Appellants separately argue claims 1 and 2 only. Independent claim 14 is only argued to the extent that Lari or Morishita do not cure the argued deficiencies with regard to claim 1.

ISSUE

Have Appellants shown that the Examiner reversibly erred in finding that Iida teaches "placing a heat shield above said crucible" and that the combined teachings of Iida and Haida teach or suggest applying a magnetic field "to establish a convection which is initially directed to a bottom of the crucible" as recited by claim 1? We decide this issue in the negative.

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of the rejection. Therefore, we will not consider this reference in determining the propriety of the Examiner's rejection. *See In re Hoch*, 428 F.2d 1341, 1342 n.3 (CCPA 1970) ("[W]here a reference is relied on to support a rejection, whether or not in a 'minor capacity,' there would appear to be no excuse for not positively including that reference in the statement of the rejection.").

PRINCIPLES OF LAW

The applicant bears the procedural burden of showing error in the Examiner's rejections. *See, e.g., In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness") (citation and internal quote omitted).

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

FINDINGS OF FACT (FF)

The following facts are supported by a preponderance of evidence in the record.

1. The Examiner finds that Iida's solid-liquid interface insulator 8, upper surrounding insulator 9, and a radiant heat reflecting plate attached to a lower portion thereof constitute a heat shield placed above the crucible (Ans. 4).
2. Iida discloses that the crystal grown by the Czochralski (CZ) method may be modified by applying a magnetic field during the crystal pulling process and is called the MCZ method (col. 4, ll. 39-48). Iida discloses that the magnetic field may be a horizontal, vertical or cusp magnetic field (col. 8, ll. 58-60). The magnetic field is applied to suppress convection of the melt so as to stably grow a single crystal (col. 11, ll. 1-3).
3. Iida discloses that the solid-liquid interface insulator 8 and the upper surrounding insulator 9 are placed above the crucible 32

(Fig. 3, col. 11, ll. 7-42). Iida further discloses that a radiant heat reflecting plate may be attached to the lower portion of the cylinder (i.e., the cylinder formed from the insulators 8 and 9) (col. 11, ll. 31-33).

4. Haida discloses applying a downwardly traveling magnetic field to the melt contained in a pot while pulling a silicon single crystal from the melt (Haida 5-6). Haida discloses that the traveling magnetic field is applied to the melt to prevent the rising thermal convection flow (13) from reaching the walls of the pot thus keeping the flow volume sufficiently large to balance the increasing melt produced from thermal convection (Haida 8; Fig. 6). Haida discloses and claims that the traveling magnetic field is directed downwardly (Haida 2).

ANALYSIS

CLAIMS 1 AND 14

Appellants argue that Iida fails to teach a heat shield (App. Br. 7). Appellants contend that the Examiner incorrectly equates Iida's heat reflecting plate with the heat shield (App. Br. 5). Appellants argue that Iida's disclosure to place the heat reflecting plate at the bottom of a cylinder does not teach that the reflecting plate is above the crucible as claimed (App. Br. 5).

Appellants' arguments are unpersuasive because they do not address the Examiner's finding that the solid-liquid interface insulator 8, the upper surrounding insulator 9, and the heat reflecting plate attached thereto constitute a heat shield (FF 1). Indeed, Iida discloses that the insulators 8

and 9 form a cylinder with the heat reflecting plate attached to a lower portion thereof (FF 3). Accordingly, Appellants have not shown error in the Examiner's finding that the insulators (8 and 9) and the heat reflecting plate constitute a heat shield positioned above the crucible 32 as plainly shown in Iida's figure 6.

Appellants argue further that Iida does not teach a traveling magnetic field that includes forming a convection which is initially directed toward a bottom of the crucible (App. Br. 7). Appellants contend that Haida does not inherently teach that the convection is initially directed toward the bottom of the crucible because the direction of convection depends on a number of factors (App. Br. 7-8).

However, Appellants' arguments improperly attack the references individually instead of addressing the Examiner's position that the combination of Iida and Haida teach or suggest applying a traveling magnetic field to produce a convection initially directed toward the bottom of the crucible. *Keller*, 642 F.2d at 425.

The Examiner finds that Iida teaches suppressing thermal convection using a magnetic field and Haida teaches using a traveling magnetic field to produce a downwardly directed flow to prevent rising thermal convection flow (Ans. 4). Based on these disclosures, the Examiner properly determines that the teachings of the references as whole clearly suggest applying a traveling magnetic field to produce a convection initially directed toward the bottom of the crucible to counteract rising thermal convection flow (Ans. 5). Haida explicitly shows in figure 6 that the thermal convection currents 13 are directed upwardly and the traveling magnetic field is directed downwardly to counteract the thermal convection flow.

Appellants' arguments that numerous factors affect the initial direction of convection fails to address the Examiner's finding that Haida explicitly teaches a downwardly directed convection to suppress thermal convection currents and Iida teaches suppressing convection of the melt, which would have suggested an initial downwardly directed convection to counteract thermal convection currents in the pot shown in Haida's figure 6. Accordingly, Appellants have not shown error in the Examiner's position that the references as whole would have suggested the claimed initial convection direction.

For the above reasons, we affirm the Examiner's § 103 rejection of claim 1 over Iida in view of Haida. Because claim 14 is not separately argued, we affirm the Examiner's § 103 rejection of claim 14 over Iida in view of Haida and Lari or Morishita.

CLAIM 2

With regard to claim 2, Appellants do not contest the Examiner's finding that Iida teaches oxygen concentrations overlapping those claimed by Appellants (App. Br. 8). Rather, Appellants argue that the oxygen concentration values obtained by Iida are achieved without an applied magnetic field as in the present invention (i.e., a traveling magnetic field) (App. Br. 8). Because claim 2, which depends from claim 1, is rejected over the combination of Iida and Haida, we understand Appellants' argument to be that there is no reasonable expectation of success of achieving the claimed oxygen concentration using Haida's traveling magnetic field in lieu of Iida's magnetic field in the process.

Contrary to Appellants' arguments, Iida exemplifies using an applied magnetic field to form a silicon single crystal having an oxygen concentration of 14 ppma, which is within the range cited by the Examiner (10-16 ppma (Ans. 5)) (Iida, col. 13, ll. 1-10; col. 14, ll. 1-13).

Moreover, Appellants' arguments regarding claim 2, unduly focus on Iida's disclosure alone instead of addressing what the combined teachings of Iida and Haida would have suggested to one of ordinary skill in the art. *Keller*, 642 F.2d at 425.

The Examiner finds that Iida and Haida teach using the magnetic fields to suppress or convection of the melt using similar magnetic field intensities (FF 2 and 4; Ans. 4-5). Haida further teaches using a traveling magnetic field. Based on these disclosures, the Examiner finds that similar magnetic fields would produce similar effects namely a downward convection (Ans. 5), which would have been reasonably expected to produce a material having similar oxygen concentrations to those claimed (Ans. 9). Appellants have not disputed or shown error with these findings.

For the above reasons, we affirm the Examiner's § 103 rejection of claim 2 over Iida in view of Haida.

ORDER

We affirm all the Examiner's rejections.

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(2009).

AFFIRMED

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